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# ICT in the developing world

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## IN-DEPTH ANALYSIS

Science and Technology Options Assessment

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**Scientific Foresight Unit (STOA)**

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# **ICT in the developing world**

## **In-depth Analysis**

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## 1. Introduction

The term “information and communication technologies” (ICTs) includes a large number of tools. Generally it consists of hardware, software, networks and media for the collection, storage, processing, transmission and presentation of information (voice, data, text, and images), as well as the related services. According to a common distinction they can be split into traditional technologies - as radio, telephones and TV - and modern ones - as computers, internet, mobile phones.

Over the most recent years, there have been increasing opportunities for inhabitants of low and middle income countries (LMICs) to have access and use ICTs. Driven by wireless technologies and liberalization of telecommunication markets, since the late 1990s in LMICs these technologies have been experiencing a large diffusion, whose pace has however varied considerably across different countries and for different tools. In the case of mobile phones it has been surprisingly fast and socially widespread. Together with the emerging of locally-developed ICT-based applications, this phenomenon has recently renewed the attention of donors towards ICTs and their potential impact on poverty reduction.

ICTs can potentially help LMICs to tackle a wide range of health, social and economic problems. By improving access to information and enabling communication, ICTs can play a role in achieving the Millenium Development Goals (MDGs), such as the elimination of extreme poverty, combating serious disease, and universal primary education.

However, the benefits of ICTs are not fully realised in many countries, for example ICTs are often out of reach of the poor and those in rural areas. In addition, the digital divide, resulting from unequal provision for access to information, knowledge and networks, can lead to a widening of inequality both across and within nations.

This study is aimed at examining the nature and extent of impact of ICTs on poverty reduction in LMICs, with the objective to provide policy options for future EU action. In detail, the study (a) describes the conditions hampering or facilitating the support of ICTs to poverty reduction and development in LMICs (ICT4D) (b) provides a focus on the specific opportunities and obstacles in the use of ICTs in the healthcare sector (c) illustrates the EU policy approach for promoting ICTs in LMICs (d) discusses the policy options that EU can embrace in this field.

This research report is based on a literature review, an online survey collecting the opinions of 145 development cooperation and/or LMICs health sector experts, and interviews with 10 of them.

## 2. ICTs and poverty reduction

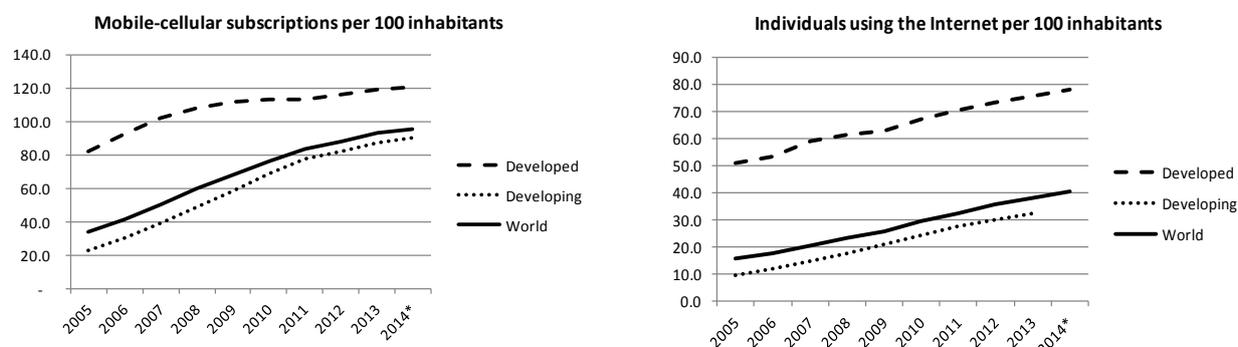
### 2.1 ICTs diffusion in LMICs: trends and constraints

Access to ICTs opportunities is unequally distributed both across and within nations. Different use and penetration of ICTs reflects country’s level of economic development, as well as technological choices. In general, the rapid adoption of mobile phones in some of the poorest countries in the world has far exceeded expectations. Nowadays, three quarters of all mobile-phone subscriptions are in LMICs and the gap with developed economies is getting thinner. In Sub-Saharan Africa (SSA) nearly 60% of the population has mobile phone coverage and mobile phone subscriptions increased by 49% annually between 2002 and 2007. Mobile phone applications are mushrooming in poor countries to overcome the limits of poor health, education, financial and transport infrastructure.

Differently, penetration of fixed landlines or wired broadband has proceeded much slower in LMICs. Though in these countries the last seven years the number of people having access to a computer and to the internet has been increasing, the divide with respect to developed economies remains large. It is estimated that there are still 4 billion people excluded from the internet and 90% of them live in LMICs.

In addition, while developed economies are progressing towards an almost universal access to broadband mobile services, this process is slower in developing economies, due to the higher accessibility costs of these technologies.

### Mobile cellular and internet diffusion data by developed and developing country groups



Source: Authors elaboration from ITU's Measuring the Information Society Report, 2014

## 2.2 Effects on economic development

A strand of the literature investigating on the potential effects of ICTs diffusion in LMICs is centred on the impact of these technologies on economic growth. There is general consensus on the relevant and positive role of ICTs in underpinning economic development. As general-purpose technologies, their contribution to a country's economic progress goes beyond their specific sector of the economy, and is generally more relevant in terms of externalities and spillovers than in terms of its direct contribution to GDP growth. This is generally assessed in terms of impact on:

- a) Growth and productivity. Most of econometric models identify a positive impact of ICTs on economic growth. An econometric analysis conducted by the World Bank across 120 countries on the growth effect of different ICTs by countries' income group shows that LMIC are to gain most for increased use of ICT. At the enterprise level, production efficiency is often reported to improve with increased ICT use thanks to lower transaction costs and time, larger market coverage, better access to knowledge and information.
- b) Trade in ICT goods and services. Some LMICs managed to accelerate economic growth and integrate in the global economy thanks to the development of IT services, for example software and hardware maintenance, application development, and ITES, i.e. services that can be delivered remotely using telecommunication networks (e.g. call-centres). India, China, Mexico and the Philippines are the LMICs that benefited most from the expansion of IT services and ITES. In India, the IT services and ITES industries contributed to nearly 25% of the country's export in 2007.
- c) Investment and public funding. Mobile operators invest heavily to provide mobile network coverage: for example in SSA they are investing in developing regional backbone infrastructure. In addition, the mobile ecosystem is a major contributor to public finance of many African countries. In 2010 up to 4.1% of total Africa government revenues came from the mobile industry.
- d) Contribution to job creation. In LMICs that have been capable to become top IT goods and services exporters and ITES global players, there have been many opportunities in relatively better paid IT jobs. Beyond the formal sector, many people also find micro-entrepreneurial opportunities, especially within the extensive network of phone card distribution system, internet cafés, mobile phone sales and repairs services. In countries where IT service export flourished job opportunities materialized also for women.

### 2.3 Potential for poverty reduction

There is widespread agreement that ICTs are powerful instruments to provide people with economic opportunities, knowledge and services that can alleviate poverty in all its dimensions. On the other hand, the benefits of ICTs remain unevenly distributed between and within countries and in some cases poor people benefit disproportionately less. The IT digital divide can prolong and deepen the existing disparities amongst income groups, gender and age groups, rural and urban citizens, educated and non-educated people.

Generally, it is acknowledged that the importance of ICTs in the development process is not in the technology used, but in its many enabling functions that include access to knowledge and socio-economic interactions. From a development policy perspective, two types of ICT applications can be identified: progressive innovations, which impact on economic growth and productivity, and transformational applications, that bring about fundamental changes to the existing social structures and balance of power. The latter are those that have the higher potential to impact on poverty and inequalities.

The significance of ICTs for poverty alleviation and reduction depends on how a specific technology can be integrated into the livelihood strategies of the poor. For example, there is abundant evidence that mobile phone technology can help alleviate poverty, by providing services that were previously unavailable to poor and remote communities. Although most evidence is limited to project level case studies, areas that are reported to have a good rate of success are education, surveys and polling, agriculture, banking the unbanked, data analysis, and health. In such cases ICT4D projects contributed to improve quality of life indicators, such as longer life, lower infant mortality and lower illiteracy through mobile telecommunications.

In general, while some benefits of ICTs uptake have already materialized in LMICs and succeeded in changing the life of people, most of the ICT potential remains to be fully exploited, especially for the lowest income groups. The use of ICTs is far from being common in schools, business, government and health systems.

### 2.4 Constraints in the use of ICT in LMICs

The further spread of ICTs in LMICs massively depends upon three interlinked factors:

- a) Policy and regulatory constraints. LMICs are still setting up national regulatory frameworks for telecommunications services, and many shortfalls still remain. Most countries would benefit from encouraging competition in terms of both cheaper and better quality telecommunication services. This would improve the affordability of such services, which is a major barrier to ICTs diffusion in LMICs.
- b) Infrastructure endowment. According to the majority of surveyed experts the harshest obstacle to ICT uptake in low income countries is related to the general weaknesses of public infrastructure - including unreliable and costly electricity supply. The quality of the network coverage is a critical aspect: slow, unreliable, and expensive telecommunication services in most African countries prevent the region from reaping the full benefits of a highly functional ICT sector. This aspect is mostly problematic in rural areas, where traffic volumes are lower and thus investments in infrastructures are less profitable.
- c) User capability. Whereas the user-friendly technology of mobile phones has made them the most used ICTs amongst the poor, the widespread use of the internet remains a challenge. Digital skills are an issue in LMICs, especially among lower income groups.

### 3. ICTs and health in LMICs

#### 3.1 E-health services and their impact

As in most ICT sectors of application, e-health has been displaying a dynamic landscape in both developing and developed countries. Within the context of fragile and emerging healthcare systems, the use of ICTs in healthcare, generally referred as e-health, has brought about many expectations concerning the possibility to overcome barriers and constraints and bring medical care to under-served communities. Looking at Center for Health Market Innovations' database (a digital platform storing information about health projects in LMICs), in 2012 out of 657 programmes based in LMICs 176 were ICT-enabled. The percentage of programmes using ICT increased from 8% in 1991-1995 up to 43% in 2006-2011. In terms of purpose behind the use of the ICT, removing geographical barriers to healthcare access was reported as by far the main driver to change.

E-health services can be grouped in 4 categories: Health Information Systems (HIS), Mobile telecommunication technologies (m-health), Telemedicine, e-learning.

#### Definitions of e-health services and applications.

Name	Definition	Applications
Health Information System	All technologies that apply electronic patient information systems to collect, store and share information about patients.	<ol style="list-style-type: none"> <li>1) Electronic medical records</li> <li>2) Electronic health records</li> <li>3) Personal health records</li> </ol>
M-health	An emerging term for medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, PDAs, and other wireless devices.	<ol style="list-style-type: none"> <li>1) Education and awareness</li> <li>2) Health conditions remote monitoring</li> <li>3) Remote data collection for HIS;</li> <li>4) Communication and training for healthcare workers</li> <li>5) Disease and epidemic outbreak tracking</li> <li>6) Diagnostic and treatment support</li> </ol>
Telemedicine	The delivery of health care services by all health care professionals using ICTs for the exchange of valid information for prevention, diagnosis and treatment of diseases, for research and evaluation and for the continuing education of health care providers.	<ol style="list-style-type: none"> <li>1) Teleradiology to transmit digital radiological images</li> <li>2) Telepathology for transmission of digitized pathological results</li> <li>3) Teledermatology</li> <li>4) Telepsychiatry</li> </ol>
E-learning	The use of ICTs in education to remove barriers to distance.	<p>In relation to the healthcare sector:</p> <ol style="list-style-type: none"> <li>1) Development of digital libraries and repositories offering medical information;</li> <li>2) Provision of medical education at the undergraduate and graduate level and for upgrading medical competencies.</li> </ol>

World Health Organization: "M-health new horizons for health through mobile technologies. Based on the findings of the second global survey on e-health", Global observatory for e-health series, 2011; "Telemedicine opportunities and developments in Member States. Report on the second global survey on e-health", Global observatory for e-health series, 2011; "Management of patient information" Global observatory for e-health series, 2012; United Nations Foundation and Vodafone Foundation: "M-health for Development: The opportunity of mobile technology for healthcare in the developing world", 2010; Al Huneiti R, Hunaiti Z, Balachandran W: "E-Learning in relation to healthcare", International Journal of Sciences: Basic and Applied Research, 2014

At global level, the use of Health Information Systems is more widespread in developed countries, that have more advanced ICT infrastructures to support such systems. With the exception of Brazil, India and China, LMICs generally struggle to find the necessary financial and human resources to scale up HIS at the national level.

Evidence on the implementation of HIS in LMICs is scarce and fragmented. However, there seems to be convergence in the literature about the advantages of adopting HIS in limited-resource country settings, in terms of improving the speed and accuracy of some regular processes within health centres.

In an analysis of the HIS landscape in 19 LMICs focusing on efforts to create national HIS, a number of common problems were identified, including the relevant fragmentation and duplication in data collection, the low interoperability across systems, and the large administrative workload generated by the introduction of electronic records. These systems are also reported to have a limited outcome in areas where data quality is notoriously poor. The small scale of implementation is another limitation given that these systems are not designed to integrate the community-level information with other regional or national information system.

The application of m-health in LMICs has recently seen an impressive growth, favoured by the high penetration rate of mobile phones amongst all income groups and their reliability and easiness of use. The most frequently reported initiatives in this ambit include health call centres/healthcare telephone help lines, emergency toll-free telephone services and emergencies. More than 80% of the countries taking part to the Global Survey on e-health launched by the World Health Organization in 2009, reported to have at least one type of m-health service.

Most evaluation of impact of m-health projects in LMICs focus on the projects' outcomes and processes illustrate how the use of m-health can improve the efficiency and the outreach of healthcare service delivery, and how they can improve treatment adherence and appointment compliance. However, there is little evidence of clinical impacts, as well as of health outcomes or cost-effectiveness improvements for all uses of m-health services besides those based on SMS.

In addition, in LMICs the m-health landscape is highly fragmented, and many programmes terminate at the end of the pilot phase.

The use of telemedicine has also seen a remarkable increase at the global level. As for other e-health services, there has been a mushrooming of telemedicine projects and little evaluations that could support a better use of these technologies in the healthcare systems of LMICs.

The existing evidence is based upon few reviews, case studies or internal evaluation of telemedicine programmes that mostly focus on process improvement. Some case studies illustrate that telemedicine in LMIC contexts can help improve patients' management and medical diagnosis, but concerns remain about the appropriateness of telemedicine to the health needs and skill availability of LMICs.

For what concerns e-learning, thanks to the increased diffusion of Internet, the number of online resources has kept increasing, including repositories and libraries for medical education.

Scattered evidence is available for these tools too. Generally, their relevant benefit has been the growing availability of e-learning resources for healthcare workers all over the world. This proved to be particularly relevant in LMICs where there is a large and unmet demand for medical information in rural areas, and where referral hospitals and academic institutions are mostly based in capital cities. Improved retention of health workers and increased cost-effectives are also two relevant advantages associated to the use e-learning in medical education in resource constrained countries.

## **3.2 Challenges**

There are several challenges that hold back a larger use of e-health in LMICs: (a) LMICs poor telecommunication and electricity infrastructure (b) the financial cost of large scale e-health programmes

(c) the uncertainty about the cost-effectiveness of e-health solutions as compared to more traditional approaches (d) lack of policy support and uncomplete legal frameworks (e.g. ownership, confidentiality and security of data) (e) skill shortage (f) the lack of leadership and donor coordination that lead to a proliferation of non-interoperable systems (g) the donor-driven implementation of e-health in LMICs, especially in low income countries.

As clearly emerged from the survey, the scarce sustainability of donors' initiatives is often a limit of e-health projects, which in general has been Achilles' heel of a number of other types of ICT-based initiatives in development cooperation.

## 4. The EU approach in promoting ICTs in LMICs

### 4.1 EU approach

The role of ICTs in the EU development policy was firstly recognised in a communication issued by the European Commission in 2001 stating the relevance of ICTs as enablers of socio-economic progress. ICTs acquired more prominence within the EU aid policy framework in 2011 with the Agenda for Change, where they are identified as powerful drivers for change with respect to job creation, economic growth, and poverty reduction. A further communication released in 2015 adds to this framework the acknowledgement that technical progress does not automatically benefit the poor.

EU intervention in support of ICT4D can be grouped in four main areas:

a) Support to the development of ICT infrastructure. Since 2007, thanks to the establishment of blending mechanisms that put together grants and loans, such as the EU-Africa Infrastructure Trust Fund, the EU has increased its support to infrastructure projects, including in the telecommunication sector.

b) Harmonisation and alignment of ICT relevant policy and regulatory frameworks. In this area the EU provides support for establishing modern and harmonized policy and regulatory frameworks for the telecommunication sector. Technical assistances are provided to relevant ministers and regulatory agencies in Latin America, ACP, Mediterranean and Eastern neighbourhood countries. From the online survey it emerged that this is among the most important actions that EU can carry out in order to remove the obstacles hampering the dissemination of ICTs in LMICs.

c) Establishing national research and education networks of EU and LMICs. Based on both building eInfrastructure and fostering participation of LMICs to the Horizon 2020 programme for research, supporting research and education network this is a characteristic feature of the EU development assistance in the ICT sector.

d) ICT capacity building initiatives. These are mostly technical assistance activities for public authorities or grants to civil society organisations to promote an inclusive use of ICTs across different sectors of society. These interventions often target national experts or ICT organizations for the purpose of increasing local capacity for benefiting from ICT use.

As for other sectors, the EU support to ICTs sector projects is built upon a regional approach. As an example, the Joint Africa-EU Strategy, that provides a framework for Africa-EU relations, aims at bridging the digital divide. Differently mainstreaming of the ICT theme in other priority sector strategies, including health, private sector and agriculture has progressed more slowly.

The following weaknesses in the EU approach in promoting ICTs have emerged during the analysis:

a) Differently from other donors and international development agencies who are leaders in the sector, the EU Development Cooperation does not have an updated policy framework to guide its interventions in the ICT sector. This results in a lack of strategic focus and in fragmented action.

b) The lack of a central repository of initiatives related to ICT in the field of development makes it difficult to reconstruct the contribution of EU institutions in promoting ICTs in LMICs. This is partly due also to the cross-cutting nature of ICTs, which are often included as specific components of other sector programmes. However, low visibility, little dissemination and the lack of documentary evidence specific to ICT4D programmes were observed.

c) The EU intervention in ICT4D is still characterized by a technology-centred approach. In general, an excessive focus on the specific ICT technologies, without a sufficient consideration of local contexts, turned out to be an endemic limit of donors' initiatives in the field of ICT4D.

d) As stressed by two past STOA studies, the EU initiatives are marked by an excessive use of a top-down approach. Since then, progress has been mixed.

In general, the results of the online survey carried out within this study suggest that the EU institutions' support to ICT4D is not likely to have considerably improved over the last ten years. For 26% of surveyed experts it neither improved nor weakened, for 8% it worsened, and 34% did not express an opinion on this aspect. Only 31% indicated an improvement or a significant improvement.

For what concerns e-health, this specific sphere of application of ICTs does not emerge as an area of strong involvement for the EU development cooperation. At present, DG DEVCO does not have a specific framework that guide the use of ICTs within the priority sector of health. As a result, the EU development approach for e-health rests on pilot initiatives, mostly focused on the use of telemedicine, and remains a mostly unexplored area.

## 4.2 Major trends and policy shift

In the first half of 2000, ICT issues were prominent in donor development agendas. Most donors developed their first ICT strategic frameworks, started implementing a diversified ICT project portfolio, and some of them established ICT-specialised unit. Since then, relevant policy shifts have been observed, resulting in a partial disengagement from ICT initiatives. As the private sector emerged as important investor in LMICs, there has been less and less emphasis on supporting telecommunication infrastructure, with attempts to mainstreaming ICT into development programs failing to effectively make a dent into poverty reduction.

Only in recent years, thanks to the stunning growth of ICTs worldwide, and especially the high penetration rate of mobile phone in LMICs, the usage of ICTs in development initiatives gained a new momentum bringing about a renewed discussion amongst the donor community. In particular, donors have been increasingly financing research that investigate the impact of ICT on poverty reduction and also started questioning whether traditional approaches are suitable for supporting local innovation.

There are different strategies in how to mobilise resources for ICTs in development cooperation. In the last years, donors support for the ICT sector has shifted from financing infrastructure to providing assistance for ICT policy and regulatory frameworks and IT capacity building. Some donors, such as the World Bank and the African Development Bank, are increasingly financing the development of applications for mobile phones, including for the health sector. Donors generally combine a two-pronged approach for promoting ICT in LMICs that is based on targeted intervention for the ICT sector (e.g. financing broadband infrastructure, support to IT-based industries), and mainstreaming of ICTs in priority sectors.

The wide use of ICT in health development cooperation has only recently emerged, thanks to the high penetration rate of mobile phones that opened new opportunities for universal health coverage. Whereas some donors, including the EU or France, have been focusing on pilot telemedicine projects, others, such as the World Bank and the African Development Bank have been supporting the use of m-health applications. In most cases, e-health projects in LMICs still have a small scale and a pilot nature.

## 5. Policy options

On the basis of the collected evidence there are a number of considerations on rationales, advantages and disadvantages concerning the approaches that the EU could pursue to promote ICTs in LMICs.

### 5.1 Reduce EU support to ICT4D in LMICs

Given the fast spread of mobile phone technologies and the increased availability of locally developed ICTs in LMICs, experts perceive a reduction of EU support to ICT4D as a missing opportunity: only 3% of survey participants believe EU should follow this option. They are convinced that ICTs diffusion *per se* can potentially deepen inequalities since the possible economic growth it can trigger does not necessarily lead to a poverty decrease. Specific interventions in the area of health, education, agriculture, microfinance can better address poverty alleviation and decrease. According to this view donor-driven ICT solutions are rarely the most effective and cost-effective ones to address problems faced by LMICs in relation to poverty, due to issues as the cost and expertise involved. Along this line, there could be rooms for maintaining the idea that ICT should be adopted as a solution to poverty only when there is enough supporting evidence about its effectiveness.

### 5.2 Keep a top-down approach

EU Development Cooperation interventions in the field of ICTs are traditionally characterized by a top-down approach, addressing policy and regulatory frameworks or supporting the construction of infrastructures. It is recognised that by reducing systemic constraints these interventions aim at improving accessibility to ICT. Advantages of these initiatives are manifold: (a) they contribute to tackle the barriers that mostly hamper the use of ICTs for development in LMICs, namely infrastructural endowment and affordability (b) they allow to concentrate funding in projects with a wide regional scope, that is key for creating markets with a sufficient critical mass (c) they are not jeopardized by the poor durability that often affect bottom-up initiatives (d) they entail easier organizational and administrative arrangements (e) EU Institutions have already gathered experience in these ambits over years (f) in the area of regulation most African countries have already taken EU countries' ICT regulatory frameworks as benchmark.

On the other hand access to ICTs is not enough to achieve development outcomes, and in particular poverty reduction. Often top-down initiatives have been technology-driven, with too much focus on reducing the digital divide, and less emphasis on capabilities. So far EU has done little to support ICT use by the poors, and to this regard a purely top-down approach can be limited. This can explain why only few surveyed experts (7%) selected this policy option.

A possible improvement is seen in strengthening the reach and development impact of existing top-down initiatives, for example including in infrastructures projects conditions for an open access regime with non-discriminatory and transparent prices, leveraging policy dialogue with recipient countries to increase awareness about the potential use of ICT for economic growth and poverty reduction.

### 5.3 Move towards a bottom-up approach

26% of surveyed experts think that EU should move towards a bottom-up approach. Bottom-up initiatives show some clear advantages: (a) they can address directly the poorest (b) they allow to involve local actors in the decision making process (c) they can be more aligned to local capacities and support innovations developed locally. Such initiatives often consist in training and educational projects targeting both the public and private sectors. They are considered to be more effective for tackling the limited IT skills that hold back the poverty reduction potential of ICTs. In addition, their implementation can be eased by the fact that they rarely require high level political support.

As already mentioned throughout the analysis, a poor sustainability is a major risk in adopting this approach. To be successful, bottom-up initiatives have to be built on deep understanding of local contexts and seek government approval. Alignment with national strategies improves the probability of scalability and sustainability. Learning from past experiences and selecting already tested and validated solutions is also advisable, rather than adopting experimental solutions that provide theoretical benefits.

In addition, it has to be taken into account that as this approach is less common in current EU development cooperation policies, so less experience is already in place to build upon. Due to a limited presence on the field, EU development cooperation would have to channel its aids through many small organizations, which is recognised as being not among its core advantages. Funding would be fragmented and a more complex management from an administrative point of view would be faced by both EU institutions and recipients.

#### **5.4 Balance a bottom-up and top-down approach**

The majority of surveyed experts (52%) believe that EU ICT4D policy should rather adopt a mix of top-down and bottom-up policies. This would expand the range of possible interventions for EU development cooperation in ICT4D, so that the most appropriate mix of initiatives could be chosen in function of different context variables. This option would allow to (a) address both ICT accessibility and capacity constraints (b) build upon EU existing experience related to supporting research networks (c) design initiatives better suited to support local innovations.

On the other hand, a mixed approach could be more difficult to implement as it is based on a larger variety of options that need to be combined to achieve synergies. It also requires that recipient countries have a vision or strategy for the digital development of their economies and societies. Last but not least, embracing this approach would reduce the concentration of funding.

#### **5.5 Key additional aspects**

Besides specific policy options, key significant aspects that often hamper the effectiveness of donor initiatives in the field of ICT should be borne in mind in designing EU interventions for promoting ICT:

- a) Lack of donor cooperation limits the scalability and interoperability of ICT4D projects. The majority of survey respondents indicated that EU cooperation with other international organizations in this field is insufficient. EU has thus scope to improve this aspect of its policies, and in particular it could improve its federating role among EU Member States.
- b) Technology-driven approaches, poorly aligned with LMIC contexts and promoting the use (and dependency from) ICTs that are developed by industrialized countries are not likely to survive. Donors should develop initiatives aligned with local systems, avoiding that their projects create “parallel systems” draining (scarce) human resources from the public sector.
- c) Integrating ICTs within other priority sectors allows to fully seizing the development potential of ICT in different sectors of LMICs economy and society, but it requires that sector staff is familiar with the possibility to use ICT effectively within their sector of expertise, and it increases the risk of dispersing ICT4D knowledge across donor organizations. To address these issues some donors established ICT support units. DEVCO does not have such a unit in place, but it sometimes relies on DG Connect expertise for ICT programme design and implementation (e.g. e-infrastructure projects). An alternative approach to a full mainstreaming of ICT consists of increasing the use of ICT in a limited number of sectors, as health and education. These two areas have been indicated by experts as those in which EU Institutions should mostly increase the use ICTs.

## 6. Conclusions

Even if ICTs can positively affect the society as a whole, effects on poverty are more controversial. Technical progress does not benefit the poor automatically, and uneven access to ICTs in LMICs can lead to a widening of existing inequalities among territories and social groups. The impact of ICTs on the life of the poor rests on a combination of technical, political and cultural factors.

There are many barriers that still hold back ICT diffusion in LMICs: poor infrastructure endowment, including electricity supply, scarce affordability, especially of the internet and of wired broadband connection, weak local political support not helping to raise adequate financing for necessary local infrastructure, flawed policy and regulatory frameworks establishing a barrier to competition that in turn hampers prices from falling down, literacy and digital literacy amongst the poor.

Poor durability of projects has so far hampered donors' interventions to tackle these barriers and to use ICTs for poverty reduction. This is true especially for interventions with a bottom-up approach. The risk of a poor durability is frequently rooted into the first stage of projects, when their design does not include a thorough consideration of the conditions at which they can endure after the pilot phase, including adequate provisions for project maintenance or for capacity building. Assessment of local capacity is not adequately integrated in the project design to reflect the level local IT competences, social and cultural norms. Lack of donor coordination, combined with lack of local leadership, leads to a proliferation of unsustainable business models with a short-lived impact.

A weak sustainability also undermines initiatives in the healthcare sector of LMICs. This ambit has gradually seen a larger use of ICTs for a variety of purposes, including increasing outreach of healthcare services, improved medical knowledge of local health staff, and support to patient management or improve disease surveillance. However, most e-health projects in LMICs are still in their pilot phase and have a local scale. Scalability at the regional and national level remains often unexplored, whereas cost-effectiveness of e-health interventions is rarely integrated in evaluation or impact studies. A robust body of evidence on the effectiveness of e-health on the large scale is still not available.

Although it is not a leading donor in this specific sector, the EU has actively promoted ICT in LMICs with interventions for the harmonisation of ICT policies and regulatory frameworks, ICT infrastructure development, ICT capacity building, and collaboration in ICT research and innovation. As for other sectors of the EU development cooperation, the geographical focus, has been on African, Caribbean and Pacific Group of countries.

The EU approach in this field is not guided by a strategic framework that identifies priority areas for action. So far, the approach followed was to integrating ICT in regional strategies and mainstreaming across focal sectors. However, whereas the latter has been implemented, integration of ICT in other sectors as an instrument to improve development outcomes, programme effectiveness and efficiency, is progressing slowly. For what concerns the health sector, the use of ICT is still at its early stage of development in the EU development cooperation and mostly focused on supporting the use of telemedicine and the establishment of medical research networks.

Still driven by a technology-centred and top-down approach, the EU cooperation is not perceived to having being improved significantly over the last ten years in the field of ICTs. Traditionally core of EU interventions are top-down, based upon a policy dialogue with recipient country governments to modify regulatory conditions and establish a more enabling business environment. This is an area where the EU is perceived to be effective. Funds concentration, through an increased use of budget support and infrastructure investment facilities, suggests that the EU is not moving towards a more bottom-up approach.

As more evidence on the positive impact of ICT on the life of the poor emerges, most experts support an increase in the commitment of EU development cooperation in the ICT sector. Evidence of the study

suggests that there are rooms for EU Institutions to enhance the effectiveness of their ICT4D interventions by having a more balanced approach combining bottom up and top down interventions in function of different context variables, such as recipient countries' level of development, the strength of the government, civil society and the private sector. Many EU member states are also actively supporting ICT with their national cooperation systems. However, it appears to be little coordination of approaches and interventions that could be achieved with the federating capacity of the EU.



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Building on three literature reviews, the study first describes the conditions hampering or facilitating the support of ICT to poverty reduction in LMICs, then focuses on the specific opportunities and obstacles in the use of ICTs in the healthcare sector and, finally, it illustrates the EU policy approach for promoting ICTs in LMICs.

Evidence from desk analysis is complemented by the opinions of 145 surveyed experts, ten of which were also interviewed. Experts' opinions confirm the evidence of desk analysis pointing to health and education as the main areas in which ICTs can play a significant role in LMICs development.

On the basis of the evidence collected, the study discusses the options that EU policies can follow in this field, in particular by illustrating advantages and drawback of top-down and bottom up approaches.

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